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1 December 1966

Project 8615

Final Test & Acceptance Specification

GAMMA I RECTIFYING PRINTER

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1.0 SCOPE

This document covers the tests and procedures necessary to prepare acceptance of the Gamma I Rectifying Printer. Completion of these tests will signify that the equipment has been satisfactorily assembled and that it meets customer acceptance.

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2.0 REQUIREMENTS

2.1 Inspection

Inspection shall be performed as described in Section 4 and in accordance with the procedures described in Section 3.

2.2 Functional Test

The printer shall be tested as described in Sections 5 and 6 and in accordance with the procedures described in Section 3.

2.3 Photographic Test

Photographic tests shall be performed as described in Section 6 and in accordance with the procedures described in Section 3.

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3.0 PROCEDURE

3.1 Inspection

Inspections shall be performed by Project Personnel and/or Contracting Agency Representatives. Data sheets, attached as Appendix A to this specification, shall be used to record all information obtained. Unsatisfactory conditions shall be expanded in the "Remarks" section of the data sheet, and action to remedy the condition shall be initiated. The cognizant test personnel shall sign the data sheet and indicate the date of test. The unsatisfactory conditions shall be reinspected upon completion of the remedial action, and the results noted on the data sheet.

When all areas are satisfactory, the data sheet shall be certified acceptable by signatures in the appropriate locations on the data sheets. In addition to the required signatures, the signers first initial and last name shall be legibly printed adjacent to the signature. The date of all signatures shall be indicated.

The completed data sheets shall become part of the project records and copies of the sheets shall be distributed to the Contracting Agency if so desired by said agency.

3.2 Functional Tests

Functional tests shall be performed by Project Personnel and Contracting Agency Representatives cognizant of the operational capabilities of the printer. Data sheets, attached as appendices to this specification shall be used in accordance with the procedure outlined in Section 3.1.

3.3 Photographic Test

Photographic tests shall be performed by Project Personnel in the presence of Contracting Agency Representatives cognizant of the printer capabilities. Data sheets, attached as appendices to this specification, shall be used in accordance with the procedure outlined in Section 3.1. 25X1 25X1 25X1

4.0 INSPECTION

4.1 Mechanical Inspection

The following inspections shall be made to assure that the instrument is fabricated and assembled in accordance with [redacted] standard practices. 25X1 The test results shall be recorded as "Acceptable" or "Not Acceptable" on sheet No. 1.

4.1.1 Workmanship

Inspect the instrument for quality of workmanship in fabrication, assembly and general appearance.

4.1.2 Fasteners

Inspect all screws and securing devices for tightness. Ascertain that all components are firmly doweled or pinned as required by the referenced drawings. Any part secured by set screws shall have the set screw threads coated with Loc-Tite, or the part shall be modified to accept three set screws. All screws that are Loc-Tited shall have a red indicating mark located at or near the pertinent screw.

4.1.3 Gear Trains

Inspect all gears for binding, excessive backlash, burrs, metal chips or dirt. Ascertain that all gears are lubricated with a light film of grease.

4.1.4 Film Rollers

Inspect all rollers for freedom of rotation and/or swing. All rollers shall be clean and free of scratches and nicks. 25X1 25X1 25X1

4.1.5 Light Housing

Inspect the projection lamp housing to ascertain that it is secured in position on the scan arm and that the condenser housing and slit mechanism are fastened to the lamp housing. The assembly must be located such that the slit is approximately 1/4 inch above the 70 mm film plane.

Check that the flexible boot is in position between the housing and the fan assembly. Check that the light-tight louvre is in place at the rear of the fan support.

4.1.6 Slit Mechanism

Manually adjust the slit control level and ascertain that the mechanism is capable of motion between the smallest slit position and the fully open position (040 to .110 inches. Ascertain that the slit opening remains at whatever setting is desired until an exterior adjustment to another setting is made.

4.1.7 V-Ways

Inspect all v-ways for looseness or play. Check that there is no dirt or metal chips on the ways and that the ball retainers have the proper freedom of travel. Ascertain that there is no binding or chatter during travel and that the ways have been lubricated with a light film of grease.

4.1.8 Easel Displacement Mechanism

Manually rotate the handle of the slide assembly and ascertain that the easel assembly moves fore and aft for a distance of 1.220 inches with slight overtravel at each end of the travel range. Check that the motion is free of chatter.

4.1.9 Easel Tilt Mechanism

Manually rotate the easel tilt handwheel and ascertain that the easel assembly rotates over a range of -6° to +22°. Check that the motion is free of chatter.

4.1.10 Lens Tilt Mechanism

Manually release the locking mechanism by rotating the locking handle towards the operator. Manually rotate the lens tilt knob and ascertain that the lens assembly moves from -2° to +8°. Check that the motion is free and without chatter.

Lock the tilt mechanism in place and check that the assembly is locked in position.

4.1.11 Focus Cam Position Mechanism

Manually move the lens tilt mechanism in a clockwise direction (facing the printer) to lift the cam follower from the cam surface. Rotate the cam positioning knob and note that the cam travels through its full displacement range. Gently release the lens tilt mechanism until the cam follower is in positon on the cam surface.

4.1.12 Easel Curvature

Manually rotate the easel curvature knobs and ascertain that the indicators follow the motion in a smooth manner. Check that there is no binding or chatter.

4.1.13 Component Identification

Ascertain that every electrical and electronic component is clearly and legibly identified with its proper circuit designation as indicated on the referenced drawings.

4.2 Optical Inspection

Record results on Data Sheet #2.

4.2.1 Projection Lamp

Inspect the projection lamp and ascertain that it is a Type DFR rated at 500 watts when operated on a 115 volts, 60 cycle-per-second power source. Check that the lamp is clean, properly located, and secured in its receptacle.

4.2.2 Projection Lens

Visually inspect the projection lens for cracks and/or chips. Check that the lens is clean and free of fingerprints or smudges, and that is is securely fastened in its gimbal.

4.2.3 Folding Mirror

Visually inspect the first surface of the folding mirror for cracks and/or chips within the active area of the surface. Check that the coated surface is free of scratches, fingerprints, smudges and that it is clean of dust. Check that the mirror is in position on its support frame.

4.3 Electrical Inspection

The following tests shall be performed , and the results recorded on data sheet No. 3.

4.3.1 Physical Inspection

Inspect all cables to ascertain that they are properly laced and clamped, and that all connections are firmly made. Check that all solder joints are film and clean; that all screw terminals are secure; that all crimped connectors are properly crimped.

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Check all switches to ascertain that they operate freely and have sufficient overtravel.

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4.3.2 Fuses

Inspect all fuses in the instrument for continuity, proper rating, and type as specified on the schematic.

4.3.3 Lamps

Inspect all lamps for continuity and proper rating. Ascertain that they are securely mounted in their receptacles.

5.0 FUNCTIONAL TESTS

Load the printer with 70mm and 9 1/2 inch wide film. The capacity of each film transport system is 500 feet. When the instrument is properly loaded, the following tests shall be performed and the test results shall be recorded on Data Sheet No. 4.

5.1 Power

Ascertain that the scan arm is positioned at the stored position such that switch S105 at S106 is activated and that the scan arm drive wheel is in position on the track. Check that the "Vacuum" switch is in the ON position.

5.1.1 Main Power

Connect the printer to a 115 volt, 60 cycle, single phase, 20 ampere, alternating current power source by means of the power cord provided. The receptacle that receives the connecting cable shall be of the "Twist-Lok" type with ground wire.

This connection will provide power to the printer but none of the components shall be activated.

5.1.2 Power On

Operate the "Power" switch. This will cause power to be applied to the following components:

a. Vacuum turbine

b. Projection lamp fan

c. 70 mm film transport torque motor

d. 9 1/2 inch

e. Control panel and switch illuminating lamps.

5.1.2.1 Rotate the panel illumination control and ascertain that the illumination level decreases with counterclockwise rotation.

5.1.2.2 Rotate the tension control located on the chassis panel and ascertain that the tension in the 70 mm film over the platen increases with clockwise rotation of the knob. (Thr normal setting of the control is 90 on the dial.)

5.1.3 Vacuum System

Ascertain that the 9 1/2 inch film is held flat against the easel when the vacuum switch is in the ON position. Position the switch at the OFF position and note that the film is released from intimate contact with the easel when the solenoid is de-energized. Position the switch in the ON position again and note that the film is pulled down instantly against the easel.

5.1.4 70 mm Film Transport

Check out the 70 mm film transport system in the following manner.

A. Rotate the handwheel and ascertain that it rotates freely and that the film does not move.

B. Push the handwheel towards the rear and rotate it clockwise or counterclockwise as desired. Ascertain that the film moves from left to right as the handwheel rotates clockwise and that it moves from right to left when the handwheel is rotated counterclockwise. Ascertain that unprocessed film, when placed into the film platen and transported, is, upon visual inspection, free from scratches and physical damage.

5.1.5 Glow Plate

Left the glow plate handle until the plate is in a locked position under the 70 mm platen. Ascertain that the plate is illuminated when in position.

Activate the "Print" switch on the control panel and note that the scan arm does not move.

Return the glow plate to the stored position by depressing the handle. Check that the plate illumination is extinguished.

5.1.6 Scan Arm

Position the scan control at the zero scale position and activate the "Print" switch on the control panel. Ascertain that the following occurs:

a. the fan motor voltage is removed.

b. The projection lamp becomes energized.

c. The arm sweeps across the platen during a total time interval of 12 seconds.

d. The print switch illumination is extinguished.

5.1.6.1 At the completion of the scan arm motion, note the following:

a. The projection lamp is extinguished.

b. The fan is activated.

c. The 9 1/2 inch film transport system is activated.

d. The vacuum is removed from the easel by the action of the solenoids during film transport.

e. Vacuum is re-applied at the completion of the film transport.

f. The "Print" button is illuminated at the completion of the transport cycle.

g. Note that the life counter number is increased by one count at the end of the cycle.

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5.1.6.2 Position the scan control at 70 on the scale and activate the "Print" switch on the control panel. Ascertain that the same event occur as previously described except that the total time of scan should be approximately 60 seconds.

5.1.7 9 1/2 Inch Film Transport

Ascertain that sufficient film is transported at the completion of the scan cycle to clear all exposed film from the printing area. This test may be conducted during the test outlined in Section 5.1.6.

5.1.8 Reliability Test

Operate instrument for 16 continuous hours and ascertain that it has performed without malfunction of any of the individual operating parts. Within this test can be included the photographic tests of paragraph 6.0.

6.0 PHOTOGRAPHIC TESTS

The following tests shall be performed and the results shall be recorded on Data Sheet No. 5. The resolution values obtained shall be the geometric mean of the vertical and horizontal lines as described in MIL-STD-150. Vertical lines are defined as those lines oriented perpendicular to the direction of the scan and horizontal lines are defined as those lines oriented in the direction of scan.

6.1 System Resolution

Set the slit to a 1 mm width. Position the negatives supplied by the contracting agency at the film plane. The test negative shall contain high contrast USAF targets positioned symmetrically within the format area. The targets shall have a minimum resolution value of 228 l/mm. The target shall be Itek P. N. 70900 or equal.

The targets are to be projection printed at enlarged scale on duplicating film (emulsion type 5427 or equivalent). The resolution values obtained shall be observed with a microscope and all values shall be referred to the input negative.

6.1.1 Primary Range

Set the instrument, using the computed values obtained from the slide rule, for the following conditions.

a. Maximum altitude, 10° tilt angle
b. Maximum altitude, 15° tilt angle
c. Maximum altitude, 20° tilt angle
d. Normal altitude, 10° tilt angle
e. Normal altitude, 15° tilt angle

f. Normal altitude, 20° tilt angle

g. Minimum altitude, 10° tilt angle

h. Minimum altitude, 15° tilt angle

i. Minimum altitude, 20° tilt angle

6.1.2 Additional Range

Set the instrument using the computed values obtained from the slide rule for the following conditions:

a. Maximum altitude, 0° tilt

b. Maximum altitude, ± 5° tilt

c. Normal altitude, 0° tilt

d. Normal altitude, ± 5° tilt

e. Minimum altitude, 0° tilt

f. Minimum altitude, ± 5° tilt

g. Low altitude, + 13° tilt

6.2 System Accuracy

The objective of this test is to analyze the ability of the Gamma I Rectifying Printer to reproduce, through the optical - mechanical transformations, the proper theoretical relationship between film data inserted on the input and output platens. The basis for this analysis is a comparison of the output imagery with the theoretically computed otuput image geometry for various simulated flight configurations. Input data shall be in the form of a pre-calibrated grid and circular probability error will be determined by mensuration of the output format and program adjustment of the related parameters.

The error analysis shall be performed by two methods: (a) a seven parameter least square fit, and (b) a four parameter least square fit. The error in the seven parameter analysis, when the output rectified grid

is referred to the true computer position, shall not exceed a CPE of 250 microns. The error is the four parameter analysis, when the output rectified grid is referred to the true computer positions, shall not exceed a CPE of 1000 microns.

25X1 will provide two computer programs to be compatible with the computer located at Army Map Service; specified as follows: Computer 7094 Model 2 Fortran 4 IBSYS Version 13. The first program will establish a seven parameter least square fit adjustment. The second program will establish a four parameter least square fit adjustment.

6.2.1 Test Equipment Requirements

The following test equipment and related software shall be utilized to implement this test effort.

A. Master Grid

A pre-calibrated master grid (corresponding to Part Number 70900) will be provided by the procuring agency. This input grid shall be sufficient to cover the complete ± 35 degree scan of the Rectifying Printer and will be produced on stable base 70 mm film. The negative image of the grid lines (clear lines on a dense background) shall be of high quality and all grid coordinates will be identified and provided in a form suitable for insertion in a computer program. Each coordinate will be provided with a progressive sequence number.

B. Gamma Accuracy Test Fixture

Part Number 89500

C. Photographic Film Comparator

Type 880 or equal.

D. Test Program

7 parameter.

E. Test Program

4 Parameter

F. Computer

7094 - IBM

6.2.2 Accuracy Requirements

The equipment shall demonstrate compliance with the following accuracy requirements.

A. Total distortions from all sources shall be minimized to the extent that a calibrated grid (furnished by Government), of 50 or more known points uniformly distributed over the entire format (35 degrees each side of nadir normal to the flight direction), shall when projected produce a rectified enlargement on which known points will have a CPE not greater than 250 microns at the enlarged scale after a least square adjustment for fit.

The number of parameters utilized for the adjustment shall be seven, and shall consist of pitch, roll, yaw, scale, swing, and x, y position of nadir reference. The instrument will be aligned and calibrated to yield a CPE of 100 microns as a design goal.

B. Total distortions from all sources shall be minimized to the extent that a calibrated grid (furnished by Government), of 50 or more known points uniformly distributed over the entire format (35 degrees each side of nadir normal to the flight direction), shall, when projected, produce a rectified enlargement on which known points will have a CPE not greater than 1000microns at the enlarged scale after a least square adjustment for fit.

The number of parameters utilized for the adjustment shall be four, and shall consist of scale, swing, and x, y position of nadir reference. The instrument will be aligned and calibrated to yield a CPE of 100 microns as a design goal.

6.2.3 Test Plan

6.2.3.1 Non-Equipment Effects

Film shrinkage due to unstable environmental conditions and film processing procedures will contribute to system inaccuracies and these are not attributable to equipment operation. A fiducial marking system is established on the rectifying printer output easel to isolate this particular contribution. Five notches are machined at approximately equal distances along the inside edge of each of the two film guides. Utilizing a fine pointed prick punch (Part Number 89500) whose body precisely conforms to the film guide notches. A fine pin hole may be applied to each of the ten notched output platen positions. Measurement of each hole coordinate before and after processing will provide the necessary film shrinkage data which is applied to either least square fit program.

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6.2.3.1.1 Test Procedure

A. Load a 500 foot roll of Dupont Type 228R Aero Dupe Film, 9.5 inches wide into the copy transport or the Rectifying Printer. Insert leading edge into take-up spool. (Ascertain that film is properly seated in film guides.)

B. Turn Gamma I Rectifying Printer ON.

C. Apply system vacuum

D. Utilizing Accuracy Test Fixture, P. N. 89500, punch pin hole in each of ten notched locations on output easel. (Assure that punch is accurately seated in notch prior to each punch insertion.)

E. Remove vacuum

F. Cut film at input allowing sufficient leader for comparator

G. Turn equipment OFF and remove film spool.

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H. Insert unprocessed film into comparator.

I. Start measurement sequence at leading edge of punched film. Zero - Zero reference will be at lower right hand side of Gamma output platen facing the equipment.

J. Utilizing the following sequence, measure each punched point.

10 +	8 +	6 +	4 +	2 + x_1y_2
9 +	7 +	5 +	3 +	1 + x_1y_1 = 0, 0

Since only four points may be measured at a single film position (Due to comparator stage size limitations) the film must be advanced in four steps making the last two coordinates measured on the last film portion the same as the first two coordinates measured on the new film portion, etc. Therefore the film measurement steps will be

Measure coordinate 1 , 2 , 3 , 4 film advance

Measure coordinate 3 , 4 , 5 , 6 film advance

Measure coordinate 5 , 6 , 7 , 8 film advance

Measure coordinate 7 , 8 , 9 , 10

K. Remove IBM punch cards for each sequence from comparator and retain for program.

6.2.3.2 Accuracy Test

The on-site accuracy test will consist of exposing the calibrated grid onto the copy easel for the minimum, nominal and maximum altitude set-

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tings and for tilt angles set to -5°, 0, +5°, +10°, +15°, and +20°. These tests will be repeated two (2) additional times except for the -5° and +5° filt settings. The projected grids, after processing, will be measured and compared against the true mathematical values as adjusted by the computer program.

6.2.3.2.1 Test Procedure

The following procedure will be followed to accomplish accuracy testing on the Gamma I Rectifying Printer.

A. Install master grid into input platen.

B. Apply power to Gamma and set input platen tension control at approximately 70.

C. Insert approximately 500 ft. of [redacted] 228R Aero Duplicating Film into output platen supply. 25X1

D. Insert film into output platen and attach to takeup spool.

E. Set cam at nominal position and adjust Gamma at 0° tilt.

F. Visually center nadir grid position to nadir position on input platen. Translate input film to ascertain that the platen will accommodate ± 5 degrees of roll.

G. Expose and process output imagery.

H. Overlay otuput imagery end to end to determine if nadir/0 set was correct.

I. If nadir setting is inadequate, reposition the input grid and repeat the exposure on the output platen. Continue this process until overlay is visually satisfactory. (Ahthough any disparities in the output image overlays could be removed with the roll parameter in the data reduction program, it is deemed necessary that the overlays be visually acceptable.)

THIS PROCEDURE WILL BE ACCOMPLISHED FOR MINIMUM, NOMINAL AND MAXIMUM ALTITUDES. 25X1

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J. Insert film into output platen.

K. Utilizing the accuracy test fixture (Part No. 89500), punch pin holes in each of the 10 notched locations on the output platen.

L. Print.

M. Remove output material and process.

N. Repeat Steps J through M for -5°, +5°, +10°, +15° and +20°.

O. Repeat Steps J through M for 0°, 10°, 15°, and 20° two additional times.

P. Accomplish Steps J through O for minimum and maximum cam settings.

COMPARATOR MEASUREMENT

Q. Assign appropriate sequence numbers to all coordinate points established and utilize the samesequence number on all identical output print coordinate points.

R. Insert each output film sequentially in the comparator. Repeat the following measuring procedure for all prints.

S. Start coordinate identification with program established 0, 0 grid position at leading edge of grid film, lower right position.

T. Due to comparator stage size limitations each grid must be measured in multiple steps. When translating from one step to the next, several points must be selected, and coordinates measured, which are common to both steps. Sequence numbers will identify which points are selected as common.

U. During measurement of each output print, also measure coordinates of punched hole locations to determine film shrinkage affects and their contribution to system error. Assure that same sequence numbers are assigned to these positions as during test steps in Section 6.2.3.1.

V. Accumulate all computer punch cards resulting from comparator mensuration and insert into program deck in appropriate position.

W. Process data.

6.2.4 Data Processing

The data processing for the accuracy test is performed by two 7094 computer programs. The first of these programs accepts the punched cards containing the 25X1 880 measurements of the segments of the output film. The measured points are the grid intersection images of the corresponding points on the input master, as well as the measured coordinates of the skrinkage marks which have been punched into the output film.

This first program fits the skrinkage marks to their calibrated coordinates and transforms the data (which has been measured in segments) to a common coordinate system.

The second program is the least squares adjustment which fits the theoretical model to the output measurements. The inputs to this program are the master grid coordinates, the output grid coordinates from the previous program, and information describing the rectification conditions, i.e., altitude and tilt.

Three altitude settings are allowed: $.6 \times 10^6$ ft., 1×10^6 ft., or 1.6×10^6 ft. These will be selected by punching a 1, 2, or 3 in the appropriate column of the input control card.

Six values of tilt are allowed: -3°, 0°, +5°, +10°, +15°, and +20°, selected by punching a 1 through 6 respectively in the appropriate column of the input control card.

Complete instructions for the set-up and operation of the programs will be aupplied with the program.

The program output will include a listing of the input master grid coordinates, the measured output coordinates, the residual for each point, the mean and standard deviation in x and y, and the circular probable error

for the residuals expressed in microns.

6.2.5 Test Results

Computer data should indicate the following:

A. Utilizing the 7 parameter least square fit program the error shall not exceed 250 microns.

Accept _____ Reject _____

B. Utilizing the 4 parameter least square fit program, the error shall not exceed 1000 microns.

Accept _____ Reject _____

Signatures:	Name (Print)	Signature	Date
Quality Assurance if required.	_____	_____	_____
Project Representative	_____	_____	_____
Contracting Agency Representative	_____	_____	_____

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Data Sheet No. 1

Serial No. _____

Mechanical Inspection	Accept	Not Accept
1. Workmanship		
a. Fabrication		
b. Assembly		
c. Paint		
d. General Appearance		
2. Fasteners		
a. Tightness of Screws		
b. Pinning and Doweling		
c. Set Screws		
3. Gear Trains		
a. Binding or Backlash		
b. Lubrication		
c. Burrs, Metal Chips, Dirt		
4. Film Rollers		
5. Light Housing		
a. Tightness		
b. Location		
c. Boot		
d. Louvre		
6. Slit Mechanism		
7. V-Ways		
a. Binding or Looseness		
b. Lubrication		
8. Easel Displacement Mechanism		
a. Range		
b. Chatter		
9. Easel Tilt Mechanism		
a. Range		
b. Chatter		
10. Lens Tilt Mechanism		
a. Range		
b. Chatter		
c. Lock		

Data Sheet No. 1 (cont.)

Serial No. _____

	Accept	Not Accept
11. Focus Cam Position Mechanism		
a. Range		
12. Easel Curvature		
13. Component Identification		

Remarks:

Rework: Not Required ( ) Acceptable ( )

Signatures:	Name (Print)	Signature	Date
Quality Assurance if required			
Project Representative			
Contracting Agency Representative			

Data Sheet No. 2 Serial No.____

Optical Inspection	Accept	Not Accept
1. Projection Lamp		
a. Rating		
b. Cleanliness & Location		
2. Projection Lens		
a. Imperfection		
b. Cleanliness		
c. Aperture		
3. Folding Mirror		
a. Imperfection		
b. Cleanliness		

Remarks:

Rework: Not Required (_____) Acceptable (_____)

Signatures:	Name (Print)	Signature	Date
Quality Assurance if required			
Project Representative			
Contracting Agency Representative			

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Data Sheet No. 3 Serial No. _____

Electrical Inspection	Accept	Not Accept
1. Physical Inspection		
a. Cables		
b. Connections		
c. Terminals		
d. Solder Joints		
e. Switches		
2. Fuses		
3. Lamps		

Remarks:

Rework: Not Required (_____) Acceptable (_____)

Signatures:	Name (Print)	Signature	Date
Quality Assurance: if required			
Project Representative			
Contracting Agency Representative			

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Data Sheet No. 4 Serial No._____

Functional Tests	Accept	Not Accept
1. Power		
a. Vacuum Turbine		
b. Projection Lamp Fan		
c. Torque Motors		
d. Control Panel Illumination		
e. 70mm Film Tension		
2. Vacuum		
3. 70mm Film Transport		
4. Glow Plate		
5. Scan Arm		
6. 9½ inch Film Transport		
7. Life Counter		

Remarks:

Rework: Not Required (_____) Acceptable (_____)

Signatures:	Name (Print)	Signature	Date
Quality Assurance if required			
Project Representative			
Contracting Agency Representative			

Data Sheet No. 5 Serial No. -

Photographic Tests	Accept	Not Accept
System Resolutions		
1. Maximum Altitude, 10° tilt angle		
2. Maximum Altitude, 15° tilt angle		
3. Maximum Altitude, 20° tilt angle		
4. Normal Altitude, 10° tilt angle		
5. Normal Altitude, 15° tilt angle		
6. Normal Altitide, 20° tilt angle		
7. Minimum Altitude, 10° tilt angle		
8. Minimum Altitude, 15° tilt angle		
9. Minimum Altitude, 20° tilt angle		
10. Maximum Altitude, 0° tilt		
11. Maximum Altitide, 5° tilt		
12. Normal Altitude, 0° tilt		
13. Normal Altitude, 5° tilt		
14. Minimum Altitude, 0° tilt		
15. Minimum Altitude, 5° tilt		
Accuracy		

Signatures:	Name (Print)	Signature	Date
Quality Assurance if required			
Project Representative			
Contracting Agency Representative			

_____	RESOLUTION VALUES																GAMMA 1 SERIAL NO. _____
T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	

APERTURE _____ VOLTAGE _____ FAN ON _____ DEVELOPER _____ NAME _____

SLIT _____ SCAN TIME _____ OFF _____ TIME _____

FILTER _____ TENSION _____ FILM TYPE _____ FIX _____ DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO.

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
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T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	

APERTURE _____ VOLTAGE _____ FAN ON _____ DEVELOPER _____ NAME _____
SLIT _____ SCAN TIME _____ OFF _____ TIME _____
FILTER _____ TENSION _____ FILM TYPE _____ FIX _____ DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
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T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	

APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____

DATE _____

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25X1

25X1

RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
AVERAGE																	
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AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
AVERAGE																	

APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____
DATE _____

25X1
25X1
SECRET
TOP SECRET
25X1

25X1
SECRET
TOP SECRET
25X1

RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
AVERAGE																	
T = Resol. power Lines/mm																	
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____
DATE _____

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SECRET/
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SECRET/
TOP SECRET

25X1

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GAMMA 1
SERIAL NO. _____

RESOLUTION VALUES

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____
DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO.

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____

DATE _____

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TOP SECRET

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
T = Resol. power Lines/mm																	
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APERTURE _____ VOLTAGE _____ FAN ON _____ DEVELOPER _____ NAME _____
SLIT _____ SCAN TIME _____ OFF _____ TIME _____
FILTER _____ TENSION _____ FILM TYPE _____ FIX _____ DATE _____

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TOP SECRET

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____
DATE _____

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TOP SECRET

SECRET

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____ VOLTAGE _____ FAN ON _____ DEVELOPER _____ NAME _____
SLIT _____ SCAN TIME _____ OFF _____ TIME _____
FILTER _____ TENSION _____ FILM TYPE _____ FIX _____ DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____ VOLTAGE _____ FAN ON _____ DEVELOPER _____ NAME _____
SLIT _____ SCAN TIME _____ OFF _____ TIME _____
FILTER _____ TENSION _____ FILM TYPE _____ FIX _____ DATE _____

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TOP SECRET
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TOP SECRET
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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____
DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____
DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____
SLIT _____
FILTER _____

VOLTAGE _____
SCAN TIME _____
TENSION _____

FAN ON _____
OFF _____
FILM TYPE _____

DEVELOPER _____
TIME _____
FIX _____

NAME _____

DATE _____

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RESOLUTION VALUES

GAMMA 1
SERIAL NO. _____

T PRIMARY	1 -35	2 -30	3 -25	4 -21	5 -16	6 -11	7 -7	8 -2	9 +2	10 +7	11 +11	12 +16	13 +21	14 +25	15 +30	16 +35	REMARKS
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APERTURE _____ VOLTAGE _____ FAN ON _____ DEVELOPER _____ NAME _____
SLIT _____ SCAN TIME _____ OFF _____ TIME _____
FILTER _____ TENSION _____ FILM TYPE _____ FIX _____ DATE _____

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